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(54) **Flexible distal end portion for endoscope**

(57) A distal end portion for an endoscope, comprises an elongate member (3) integrally formed with discrete apertured members (2) extending transversely of and spaced along the elongate member such that the apertures define a cavity, extending longitudinally for receiving a

light guide, the thickness of the elongate member and/or the distance between the discrete apertured members varying along the length of the end portion, such that, in use, the end portion may be flexed, the angle through which it may be flexed varying from the length thereof in dependence on the thickness and/or the distance between the discrete apertured members.

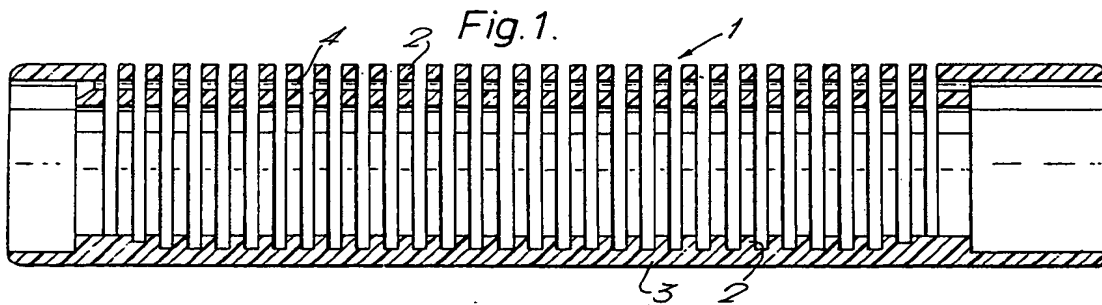


Fig.1.

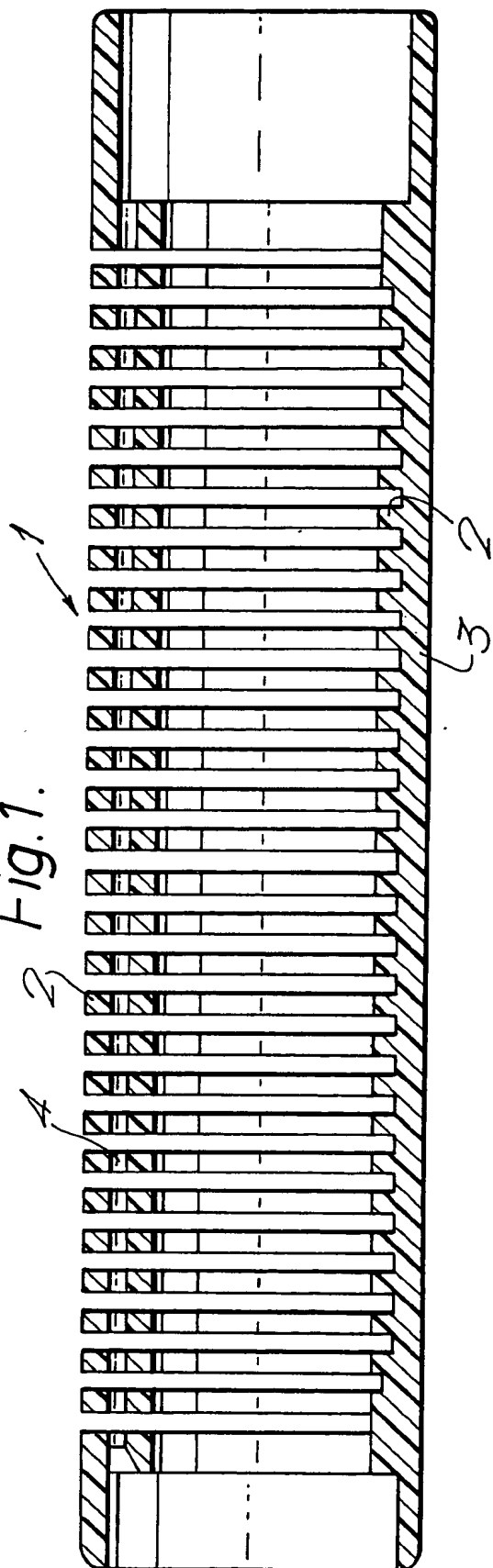


Fig.2.

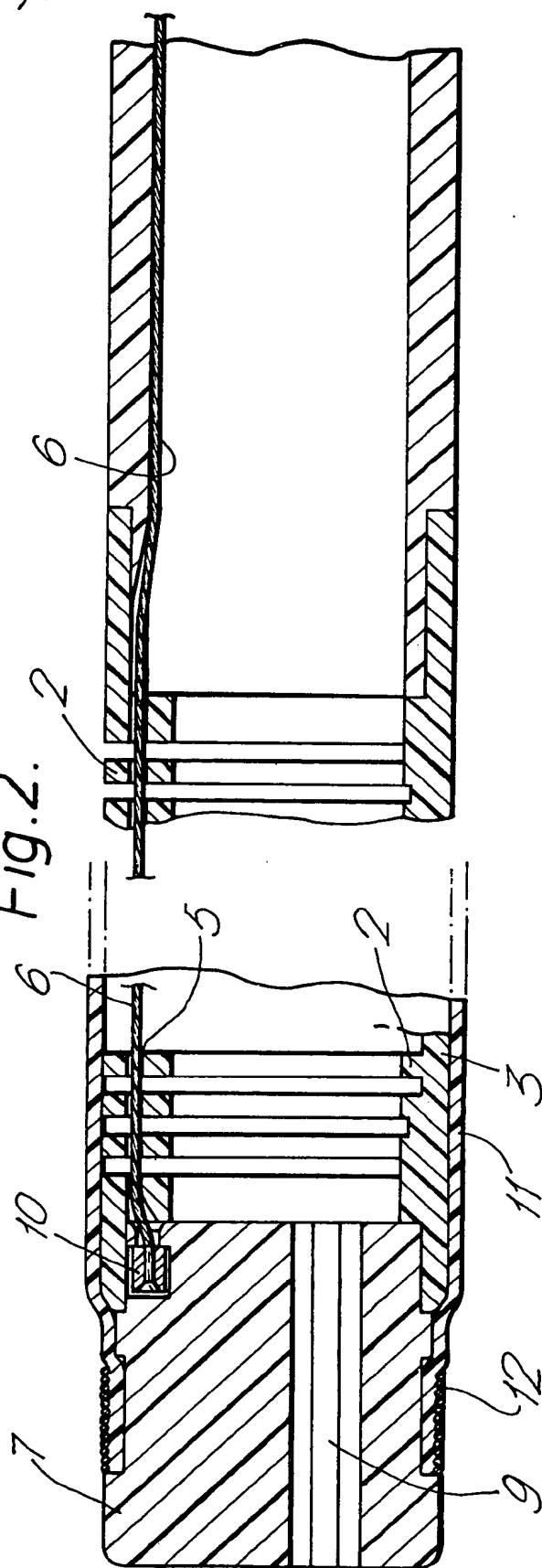
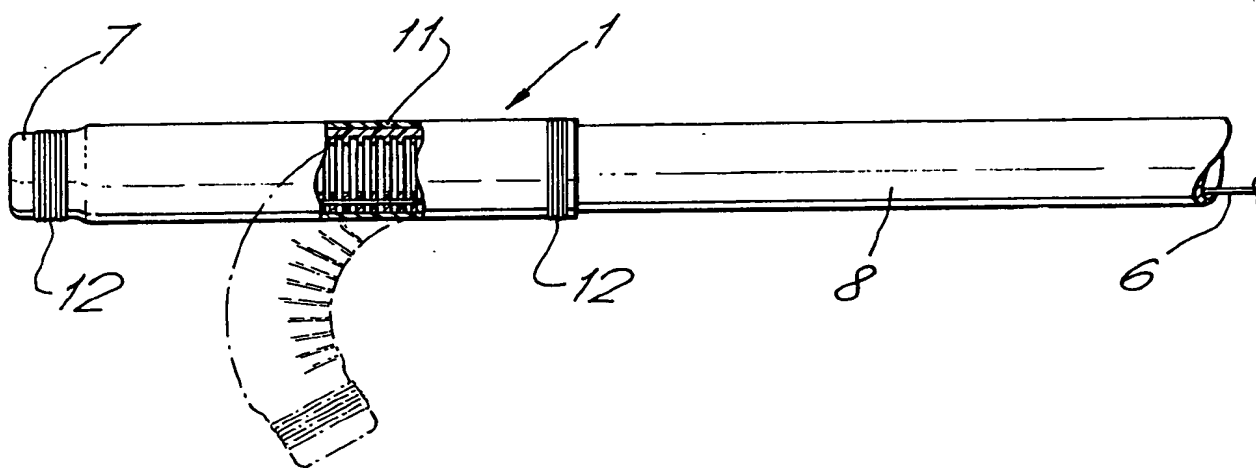
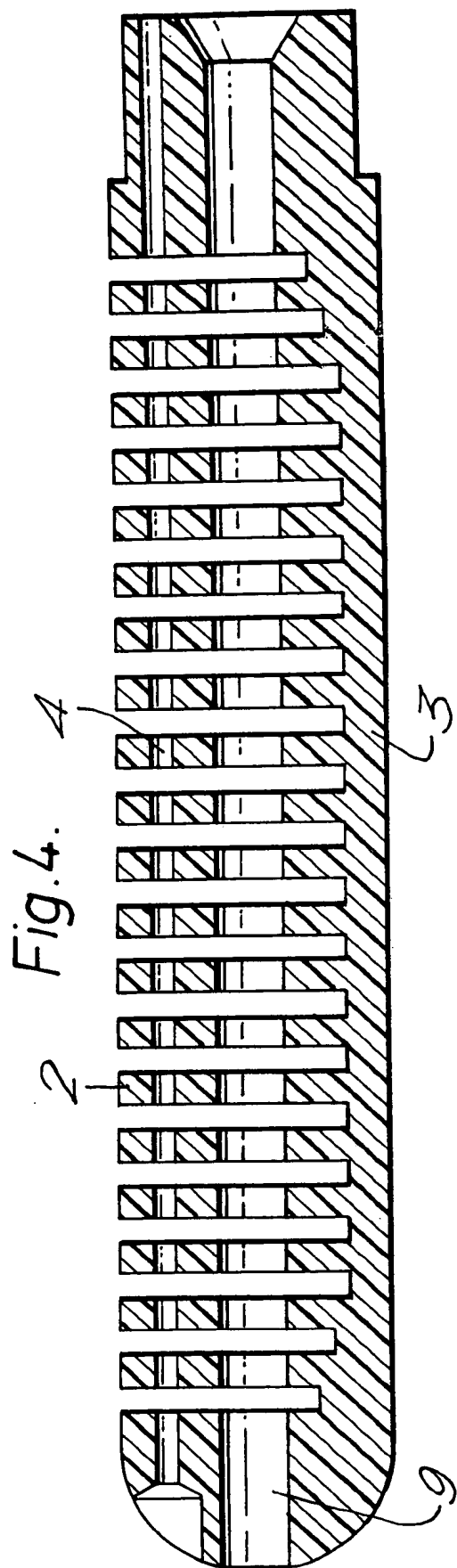


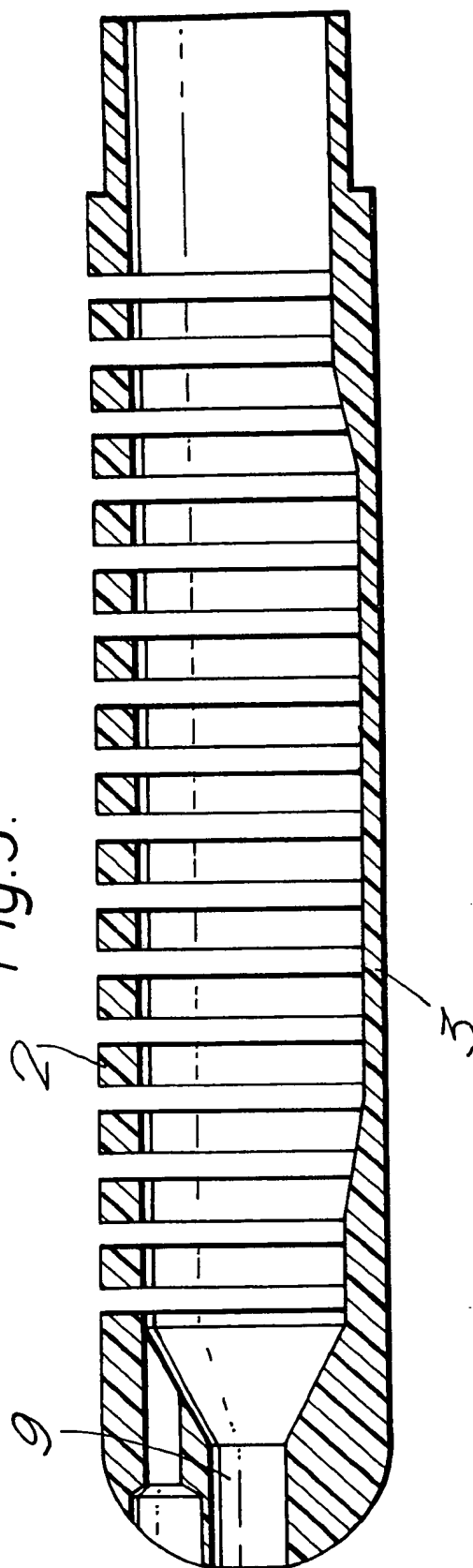
Fig. 3.





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Fig. 5.



SPECIFICATION

Improvements in or relating to flexible distal end portions for endoscopes

5 This invention relates to flexible distal end portions for endoscopes, in particular for nephroscopes.

According to the present invention there is provided a distal end portion for an endoscope, the end portion comprising an elongate member integrally formed with a plurality of discrete apertured members extending transversely of and spaced along the elongate member such that the apertures define a cavity extending longitudinally of the elongate member for receiving a light guide, the thickness of the elongate member and/or the distance between the discrete apertured members varying along the length of the elongate member, the arrangement being such that, in use, the end portion may be flexed, the angle through which the distal end portion may be flexed varying along the length of the distal end portion in dependence on the thickness of the elongate member and/or the distance between the discrete apertured members.

25 Preferably, the thickness of the elongate member decreases toward the ends of the distal end portion to prevent undue flexing thereof.

Conveniently, a hole is formed through each discrete apertured member, the holes being aligned to provide a guide channel for a steering cable.

30 In a preferred embodiment, the distal end portion is formed integrally with an end cap for the endoscope and usually the distal end portion is made of a plastics material.

For a better understanding of the present invention and to show how the same may be put into effect, reference will now be made, by way of example, with reference to the accompanying drawings, in which:

40 Figure 1 is a longitudinal sectional view of a first flexible end portion in accordance with the invention;

45 Figure 2 is an enlarged longitudinal sectional view of a distal end of the flexible end portion shown in Figure 1;

Figure 3 shows the flexible end portion of Figures 1 and 2 connected via a length of flexible tubing to a main body (not shown) of a nephroscope and illustrates the operation of the end portion;

Figure 4 is a longitudinal sectional view of a second flexible end portion in accordance with the invention; and

55 Figure 5 is a longitudinal sectional view of a third flexible end portion in accordance with the invention.

Figure 1 is a longitudinal sectional view of a first flexible end portion in accordance with the invention. The flexible distal end portion comprises a tubular body 1 formed with a plurality of transversely extending slots so that the tubular body 1 has the form of a plurality of discrete apertured members in the form of ring-

65 shaped elements or vertebrae 2 connected by an elongate member or spine 3 extending along the length of the tubular body 1. A hole 4 is formed through each of the ring-shaped elements 2 to provide a guide channel 5 extending longitudinally of the tubular body 1 to accept a steering cable 6 (Figure 2). Preferably, the tubular body 1 is moulded in a plastics material.

70 In use, the distal end of the tubular body 1 is connected to a transparent end cap 7 and the proximal end is connected via a length of flexible tubing 8 (Figure 3) to the main body of the endoscope (not shown). Although not shown, light guides for example optical fibres, flushing and biopsy channels etc. run through the flexible tubing 8 and the tubular body 1 to the end cap 7, passages 9 being provided in the end cap 7 for connection to the flushing and biopsy channels. The steering cable 6 is secured in a cable nipple 10 and a plastics sleeve 11 covers the tubular body 1. The plastics sleeve 11 is held in place by binding 12.

By use of steering controls in the main body (not shown) of the endoscope, the tension in the steering cable can be increased causing the distal end portion to flex about the spine 3 drawing the rings 2 together as shown in Figure 3. At maximum curvature, the outermost portions of the rings 2 abut.

Alteration of the depth and/or width of the slots will change the maximum degree of curvature obtainable for the distal end portion. Thus, by altering the depth and/or width of the slots along the length of the tubular body 1, the angle through which the distal end portion can be flexed can be varied along its length. Moreover, the regions of the tubular body 1 where the spine 3 is thinnest, that is where the slots are deepest, will flex first. The arrangement of slots shown in Figure 1 will prevent undue flexing of the ends of the distal end portion.

100 Figures 4 and 5 show in longitudinal section two further embodiments of the invention wherein the end cap 7 is formed integrally with the tubular body 1. In the embodiment shown in Figure 5, a separate guide channel is not provided, the presence of light guides, flushing channels etc. in the tubular body 1 being relied on to align the steering cable 6.

Claims

115 1. A distal end portion for an endoscope, the end portion comprising an elongate member integrally formed with a plurality of discrete apertured members extending transversely of and spaced along the elongate member such that the apertures define a cavity extending longitudinally of the elongate member for receiving a light guide, the thickness of the elongate member and/or the distance between the discrete apertured members varying along the length of the elongate member, the arrangement being such that, in use, the end portion may be flexed, the angle through which the distal end portion may be flexed varying along the length of the

distal end portion in dependence on the thickness of the elongate member and/or the distance between the discrete apertured members.

- 5 2. A distal end portion according to claim 1, wherein the thickness of the elongate member decreases toward the ends of the distal end portion to prevent undue flexing thereof.

- 10 3. A distal end portion according to claims 1 or 2, wherein a hole is formed through each discrete apertured member, the holes being aligned to provide a guide channel for a steering cable.

4. A distal end portion according to claim 1, 2 or 3, wherein the distal end portion is formed integrally with an end cap for the endoscope.

- 15 5. A distal end portion according to claim 1, 2, 3 or 4, wherein the distal end portion is made of a plastics material.

- 20 6. A distal end portion for an endoscope substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 3 of the accompanying drawings.

- 25 7. A distal end portion for an endoscope substantially as hereinbefore described with reference to and as illustrated in Figure 4 of the accompanying drawings.

8. A distal end portion for an endoscope substantially as hereinbefore described with reference to and as illustrated in Figure 5 of the accompanying drawings.

- 30 9. A nephroscope incorporating a distal end portion according to any one of the preceding claims.

10. Any novel feature or combination of features described herein.